

December 12, 2011

Comments on "San Jacinto River: Modeling Workshop #1" presentation August 31, 2011 and "San Jacinto River: Modeling Workshop #2" presentation November 10, 2011, San Jacinto River Waste Pits Superfund Site

On behalf of the Port of Houston Authority (PHA), HDR has preformed a cursory review of the aforementioned modeling workshop PowerPoint presentations and submits the following comments. This review is to support the PHA and allow them to proactively submit any general questions/concerns on the current modeling approach prior to the release of the modeling report expected in February 2012. This is not intended to be an exhaustive review of the actual model or serve as QA/QC of the numerical model.

GENERAL COMMENTS

A potential policy issue involves integrating the recent Total Maximum Daily Load (TMDL) with the modeling for the Remedial Investigation/Feasibility Study (RIFS). This could have ramifications for the various stakeholders that are affected by both regulatory programs. The clean-up objectives evaluated by the RIFS will likely have a range of levels with different environmental benefits, impacts and costs. The technical considerations underlying the TMDL should be well coordinated and understood so that the regulatory integration with the RIFS is meaningful now and in the future.

REVIEW COMMENTS

This cursory review focused on fundamental modeling questions typical of most hydrodynamic and transport modeling. These questions are listed below followed by responses/comments:

- *Are the appropriate models being used?*
- *Are the overall assumptions being made appropriate?*
- *Does Anchor-QEA appear to have made assumptions that are not disclosed and could affect the accuracy/legitimacy of the model?*
- *Are the boundary conditions/initial conditions being used reasonable?*
- *Is the calibration method/approach reasonable?*
- *Are the models being used in a way to provide answers needed to make educated decisions on the removal of the hazardous material?*
- *Is there any obvious part of the model (development, calibration) that the Port of Houston should be concerned with?*

Are the appropriate models being used?

Yes, the hydrodynamic model, EFDC, sediment transport model, SEDZLI, and chemical fate and transport model, QEA-FATE, are appropriate for the study.



Are the overall assumptions being made appropriate?

There are a number of points which are not clear in the presentations that could affect whether or not certain assumptions are appropriate. For example, congener selection for QEA-FATE model (slides #96-101 in WS1) is based on Toxicity Equivalence, TEQ, but all of the specific chemical congeners in the model are not specified. At least two congeners (2, 3, 7, 8 dioxin and 2, 3, 7, 8 furan), which are associated with the waste pit source, are model constituents. OCDD, which comes primarily from atmospheric fallout, is also being modeled. Which other congeners are modeled? The selection should be clearly defined and the reasons should be stated.

The sediment transport modelers assume a functional relationship between median sediment size (D_{50}) and shear stress. However, slides #29-32 of WS2 do not show the relationship. As grain size distribution data are available for surficial sediments, it is unclear why these data were not used directly (e.g., in a Thiessen polygon approach) to set D_{50} in the model.

Erosion rates were measured in sediment flumes for 15 sediment cores. Although erosion rates varied substantially in the 15 cores (slide #65) in the top 5 cm (i.e., Erosion Ratio ranges between 0.3 and 30), the erosion rate is assumed to be constant horizontally throughout the model domain (slide #66). This appears to be a gross simplification given the two orders of magnitude range in the flume data for ER.

Does Anchor-QEA appear to have made assumptions that are not disclosed and could affect the accuracy/legitimacy of the model?

It depends on how the model results will be used to assess compliance with remedial goals and regulatory criteria. For example, the water quality criteria for dioxin were not covered in the presentations. Individual congeners and Toxic Equivalency Quantity (TEQ) should be compared to Texas Surface Water Quality Standards, as applicable. The modeled congeners have to be defined (see above) to ascertain whether or not the model will provide results that address the relevant chemical constituents in TCEQ's water quality standards as well as the remedial goals.

Are the boundary conditions/initial conditions being used reasonable?

Initial conditions for the QEA-FATE model calibration period (2005-2010) are based on data collected during 2002-2005, a span of four years (slide #73 of WS2). As the TCDD concentration in surficial sediments declined by five times between 2005 and 2010, the decrease within the 2002 to 2005 period is estimated to be a factor of 3.3 based on the same rate of change during the calibration period. A more limited selection of data based on sampling year(s) is recommended. Or an analysis of temporal trend to adjust concentrations measured in 2002-2004 to 2005 levels is another way to handle this problem. As the factor of reduction in dioxin/furan concentrations of surficial sediments is a key calibration target for the QEA-FATE model (slide #73 of WS2), the initial conditions should be defined more precisely than they are currently defined.

Is the calibration method/approach reasonable?

The broad perspective of the calibration method entails not only the conceptual approach but also practical considerations such as the quantity and quality of the field data that are being used in the calibration. The hydrodynamic model calibration used tidal elevation measurements at one location and velocity measurements at one station in 2010 and another station in 2011 (slides #19-21 of WS2). Unless there are other stations that were not shown, two velocity stations are sparse coverage for the extent of the San Jacinto River being modeled. The model-computed East-West velocity component is about half of the measured velocity component during June 16 – July 5, 2010 (slide #20 of WS2). The model underestimates velocity in the West direction during May and June 2011 when the flow was reported as 0 cfs, which is surprisingly low for a river like the San Jacinto. The underestimation of the E-W velocity component in the model indicates that tidal transport is underestimated and the transport of sediment and contaminants upstream of the waste pit is lower than the actual extent. Salinity is often modeled as a tracer of ocean water in estuarine systems; however, the EFDC model does not appear to include salinity (slide #10 of WS1), which (if it were included) could be calibrated to field measurements.

The radioisotope data for 10 sediment cores collected in 2011 are the basis for quantifying the net sedimentation rate (NSR), which is a primary calibration target for the sediment transport model. The core locations (slide #34 of WS2) show a large spatial gap between station 6 north of the I-10 Bridge and stations 7 and 9, south of the bridge. The Cs-137 data did not conform to the typical profile found in depositional waterways (slide #35 of WS2). We expected this in a tidal river like the San Jacinto. The one core in which Cs-137 data yielded an estimate of NSR (station 5) showed a complete change from 100% clay/silt above 60 cm to 100% sand below 60 cm (slide #39). This suggests an unnatural disturbance (e.g., dredging or filling) affected this area around the time of the high radioactive fallout and hence this core is not appropriate for accurately quantifying the NSR. The Pb-210 data analysis yielded NSR relationships in eight cores; however, the r-squared values for the regressions in slides #39-42 were low (0.41 to 0.52). Therefore, the estimated NSR results of the radioisotope analyses should be taken as rough approximations, and the use of these results as the primary target for the sediment transport model calibration has limited reliability. The secondary target for the model calibration is total suspended solids (TSS) data collected at one station in 2011 (slide 77 of WS1). Neither presentation described the sampling methods or the quantity of TSS data to assess the usefulness of this data in the sediment transport model calibration.

Are the models being used in a way to provide answers needed to make educated decisions on the removal of the hazardous material?

The modeling framework has the potential to serve adequately as a tool for the RIFS as long as the concerns raised by this review are addressed. There are, of course, practical limits to dealing with issues related to the available data and adhering to the schedule for the modeling. Nevertheless, the modeling uncertainty can be analyzed and taken into consideration when evaluating the model projections of the “No Action” and remedial measure alternative.

Is there any obvious part of the model (development, calibration) that the Port of Houston should be concerned with?

The overall relationship of this modeling study to support the RIFS with the recent TMDL study by TCEQ was not addressed in the two workshop presentations. Although our review did not look at the TMDL, the two regulatory processes appear to be using two different models to develop water quality management plans for the San Jacinto River. It is essential that the RIFS incorporate results of the TMDL study and TCEQ plans and policies in a manner that is consistent with the ongoing modeling study.

Any questions concerning these comments should be communicated to Linda Henry, Port of Houston Authority.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ronald L. McPherson', with a long horizontal flourish extending to the right.

Ronald L. McPherson
Coastal Engineer

cc. Kerry Snyder, AICP, Project Manager
T. Neil McLellan, P.E.
Guy Apicella, Water Resources Modeling Section Leader